3. STUDY DESIGN AND METHODS

Chapter Three presents the study design and methodology used in the National Elder Abuse Incidence Study (NEAIS). The chapter begins with the definitions of elder abuse, neglect, and exploitation. It then presents the sampling methodology for both Adult Protective Services (APS) and sentinel agencies, and agency recruitment and training procedures. This chapter then describes the data collection methodology, the unduplication of reports, and weighting of final results. Finally, a brief discussion of interpreting research results in the presence of sampling variability is provided to assist the reader in understanding the study findings, which follow in the next chapter.

3.1 Definitions

One of the problems in collecting data on elder maltreatment from states is a lack of comparability in the definitions of abuse, neglect, and exploitation. This lack of comparability stems largely from the fact that ours is a federal system of 50 semi-sovereign states. In addition to the variability among state laws, experts continue to disagree on definitions; for example, there has not been a universal acceptance of the federal definitions of elder abuse found in the Older Americans Act. A common set of definitions across jurisdictions is essential for a national study. For this reason, NEAIS developed a set of standardized definitions of elder mistreatment for the study. The use of these standardized definitions, along with thorough training of the people who collected data in the study sites, ensured greater comparability and reliability of results.

Steps in Establishing Definitions

The development of standardized elder abuse definitions involved several steps, including (1) an initial analysis of current state definitions of domestic elder abuse; (2) the convening of local roundtables of practicing professionals to gather firsthand information about how elder abuse is detected, reported, and investigated; (3) a critical review of preliminary definitions by a group of elder abuse experts; and, finally, (4) pilot testing the consensus definitions in both APS and sentinel agencies.

Analysis of Current State Definitions. A table that documented the frequencies of the components of the definitions (see Appendix A) was prepared, following the analysis of existing state laws defining abuse, neglect, and exploitation. The components of the definitions were categorized by type of abuse and state. The specific types of abuse, and any subcategories, were identified. The most common components across the states were selected as potential elements of NEAIS definitions.

Convening of Local Roundtables. Two roundtables of local professionals who deal with elder abuse, neglect, and exploitation were convened in February 1995 in San Francisco and in Washington, DC. The purpose of these roundtables was to obtain firsthand information from professionals working at the community level regarding how elder abuse is detected, reported, and investigated. The information obtained from these roundtables aided in the development of the standardized elder abuse definitions. (See Appendix B.)

Consensus Meeting. A consensus meeting was held in Washington, DC, on May 1 and 2, 1995. Participants included the members of the advisory committees of both the National Elder Abuse Incidence Study and the National Center on Elder Abuse, the APWA staff of the National Center on Elder Abuse (NCEA), the staff of NCEA's Consortium organizations, and Westat. Participants discussed the design of the study and provided an in-depth analysis of the draft definitions. Based on the discussion at this meeting, the definitions were revised and prepared for pre-testing. (See Appendix C.)

Pilot-Testing. The definitions were pilot-tested in local Adult Protective Services (APS) and sentinel agencies and revised through iteration, based on the results of the tests. The pilot testing process is discussed in greater detail in a later section of this report.

Definitions of Elder Abuse, Neglect, and Exploitation

The following definitions of domestic elder abuse, neglect, and exploitation developed for the study pertain to elders living in non-institutionalized settings.

Physical abuse is the use of physical force that may result in bodily injury, physical pain, or impairment. Physical abuse may include but is not limited to such acts of violence as striking (with or without an object), hitting, beating, pushing, shoving, shaking, slapping, kicking, pinching, and burning.

The unwarranted administration of drugs and physical restraints, force-feeding, and physical punishment of any kind also are examples of physical abuse.

Sexual abuse is nonconsensual sexual contact of any kind with an elderly person. Sexual contact with any person incapable of giving consent also is considered sexual abuse; it includes but is not limited to unwanted touching, all types of sexual assault or battery such as rape, sodomy, coerced nudity, and sexually explicit photographing.

Emotional or psychological abuse is the infliction of anguish, emotional pain, or distress. Emotional or psychological abuse includes but is not limited to verbal assaults, insults, threats, intimidation, humiliation, and harassment. In addition, treating an older person like an infant; isolating an elderly person from family, friends, or regular activities; giving an older person a "silent treatment"; and enforced social isolation also are examples of emotional or psychological abuse.

Neglect is the refusal or failure to fulfill any part of a person's obligations or duties to an elder. Neglect may also include a refusal or failure by a person who has fiduciary responsibilities to provide care for an elder (e.g., failure to pay for necessary home care service, or the failure on the part of an in-home service provider to provide necessary care). Neglect typically means the refusal or failure to provide an elderly person with such life necessities as food, water, clothing, shelter, personal hygiene, medicine, comfort, personal safety, and other essentials included as a responsibility or an agreement.

Abandonment is the desertion of an elderly person by an individual who has assumed responsibility for providing care or by a person with physical custody of an elder.

Financial or material exploitation is the illegal or improper use of an elder's funds, property, or assets. Examples include but are not limited to cashing checks without authorization or permission; forging an older person's signature; misusing or stealing an older person's money or possessions; coercing or deceiving an older person into signing a document (e.g., contracts or a will); and the improper use of conservatorship, guardianship, or power of attorney.

Self-neglect is characterized as the behaviors of an elderly person that threaten his/her own health or safety. Self-neglect generally manifests itself in an older person's refusal or failure to provide himself/herself with adequate food, water, clothing, shelter, safety, personal hygiene, and medication

(when indicated). For the purpose of this study, the definition of self-neglect **excludes** a situation in which a mentally competent older person (who understands the consequences of his/her decisions) makes a conscious and voluntary decision to engage in acts that threaten his/her health or safety.

The signs and symptoms of the seven kinds of abuse and neglect are summarized in Table 3-1. It should be noted that some signs and symptoms characterize several kinds of maltreatment. The most important of these are the following:

- Frequent unexplained crying; and
- Unexplained fear of or suspicion of particular person(s) in the home.

Table 3-1. Signs and symptoms of abuse and neglect

Physical Abuse
■ Bruises, black eyes, welts, lacerations, and rope marks
■ Bone fractures, broken bones, and skull fractures
■ Open wounds, cuts, punctures, untreated injuries, and injuries in various stages of healing
■ Stains, dislocations, and internal injuries/bleeding
■ Broken eyeglasses/frames, physical signs of being subjected to punishment, and signs of being restrained
■ Laboratory findings of medication overdose or under utilization of prescribed drugs
■ An elder's report of being hit, slapped, kicked, or mistreated
■ An elder's sudden change in behavior
■ A caregiver's refusal to allow visitors to see an elder alone

Table 3-1. Signs and symptoms of abuse and neglect (continued)

Sexual Abuse
■ Bruises around the breasts or genital area
■ Unexplained venereal disease or genital infections
■ Unexplained vaginal or anal bleeding
■ Torn, stained, or bloody underclothing
■ An elder's report of being sexually assaulted or raped
Emotional/Psychological Abuse
■ Emotional upset or agitation
■ Extreme withdrawal and non-communication or non-responsiveness
■ An elder's report of being verbally or emotionally mistreated
Neglect
■ Dehydration, malnutrition, untreated bedsores, and poor personal hygiene
■ Unattended or untreated health problems
■ Hazardous or unsafe living conditions (e.g., improper wiring, no heat or no running water)
■ Unsanitary or unclean living conditions (e.g., dirt, fleas, lice on person, soiled bedding, fecal/urine smell, inadequate clothing)
■ An elder's report of being neglected
Abandonment
■ The desertion of an elder at a hospital, nursing facility, or other similar institution
■ The desertion of an elder at a shopping center or other public location
■ An elder's own report of being abandoned

Table 3-1. Signs and symptoms of abuse and neglect (continued)

Financial or Material Exploitation
■ Sudden changes in a bank account or banking practice, including an unexplained withdrawal of large sums of money by a person accompanying the elder
■ The inclusion of additional names on an elder's bank signature card
■ Unauthorized withdrawal of funds using an elder's ATM card
■ Abrupt changes in a will or in other financial documents
■ Unexplained disappearance of funds or valuable possessions
■ Provisions of substandard care or bills unpaid despite the availability of adequate financial resources
■ The provision of services that are not necessary
■ Discovery of an elder's signature forged for financial transactions or for the titles of the elder's possessions
■ Sudden appearance of previously uninvolved relatives claiming rights to an elder's affairs and possessions
■ Unexplained sudden transfer of assets to a family member or someone outside the family
■ An elder's report of financial exploitation
Self-Neglect
■ Dehydration, malnutrition, untreated or improperly attended medical conditions, and poor personal hygiene
■ Hazardous or unsafe living conditions (e.g., improper wiring, no indoor plumbing, no heat or no running water)
■ Unsanitary or unclean living quarters (e.g., animal/insect infestation, no functioning toilet, fecal/urine smell)
■ Inappropriate and/or inadequate clothing, lack of necessary medical aids (e.g., eyeglasses, hearing aid, dentures)
■ Grossly inadequate housing or homelessness

3.2 Sampling Counties, Agencies, and Sentinels

Sampling at the County Level

The design for NEAIS employed a stratified multistage sample of 20 nationally representative counties, selected with probability proportional to the number of elders living in these areas. These counties, called Primary Sampling Units (PSUs), were stratified by five variables: geographic region, metropolitan area, elder abuse reporting requirements (mandatory and non-mandatory), percentage of elders, and percentage of poor elders. The use of probability proportional to size (PPS) ensures an approximately self-weighting sample—that is, every abused elder in the country has approximately the same chance of being identified, regardless of location, when the measure of size is the number of elders in the PSU.

This methodology produced the sample presented in Table 3-2 on page 3-9. Note that five counties were selected in each of four regions defined by the Office of Business Economics (OBE). These four regions have approximately equal populations. Five counties were from non-metropolitan areas, and five were from non-mandatory reporting states (i.e., where there is no state law requiring professionals to report suspected elder abuse). Note also that the numbers and percentages of elders are shown, as well as the percentage of the total county population that is made up of persons 60 years of age and older. The description of sampling methodology, presented in Appendix D, provides additional details on the distribution of counties in each of these strata.

Figure 3-1 on the next page shows the states participating in the NEAIS separated into the four OBE regions: Northeast (Region 1); Southeast (Region 2); Central (Region 3), and West (Region 4).

Sampling Sentinel Agencies within Counties

The sentinel agencies were divided into four major categories: financial institutions (banks); law enforcement agencies (sheriff's departments and municipal police departments); hospitals (including public health departments); and elder care providers (ECPs), (e.g., adult day care centers, senior centers, home health care agencies). The sources for identifying sentinel agencies included the following:

- Law enforcement—National Directory of Law Enforcement Administrators;
- Hospitals—American Hospital Association Guide;
- Public Health Departments—National Directory of Local Health Departments;
- Banks—Dun & Bradstreet; and
- Elder care providers—National Directory for Eldercare Information and Referral and local Area Agency on Aging (AAA) Directories of Elder Care Providers.

Figure 3-1. States by OBE region, with participating NEAIS states in gray

Table 3-2. Sampled counties for the National Elder Abuse Incidence Study

OBE Region	County	State	Metro status	Mandatory reporting	Number of elders (% of population of the county[1])	% of poorer elders[2]	PSU probability
1	Delaware County	PA	metro	no	113,225(20.67%)	6.99%	0.05418
1	Fayette County	PA	metro	no	34776(23.93%)	14.26%	0.01664
1	Bristol County	MA	metro	yes	96,576(19.07%)	10.40%	0.04621
1	Mercer County	NJ	metro	no	57,195(17.55%)	6.96%	0.02737
1	York County	ME	nonmetro	yes	27,911(16.96%)	9.28%	0.01336
2	Pulaski County	AR	metro	yes	54,111(15.48%)	14.10%	0.02607
2	Pinellas County	FL	metro	yes	271,330(31.86%)	7.70%	0.13071
2	Cleveland County	NC	nonmetro	yes	15,351(18.12%)	16.38%	0.00740
2	Madison County	NC	metro	yes	3,644(21.49%)	32.52%	0.00176
2	Giles County	TN	nonmetro	yes	5,311(20.63%)	21.79%	0.00256
3	Dupage County	IL	metro	no	95,655(12.24%)	3.67%	0.04624
3	St. Clair County	IL	metro	no	44,998(17.12%)	11.21%	0.02175
3	Platte County	MO	metro	yes	6,585(11.38%)	6.50%	0.00318
3	Bay County	MI	metro	yes	20,125(18.01%)	9.74%	0.00973
3	Presque Isle County	MI	nonmetro	yes	3,680(26.78%)	16.49%	0.00178
4	San Diego County	CA	metro	yes	360,842(14.45%)	6.00%	0.17265
4	Maricopa County	AZ	metro	yes	347,277(16.37%)	8.50%	0.16616
4	Grayson County	TX	metro	yes	20,088(21.14%)	15.47%	0.00961
4	Multnomah County	OR	metro	yes	101,659(17.41%)	10.08%	0.04864
4	Rusk County	TX	nonmetro	yes	9,575(21.89%)	19.57%	0.00458

[1] The regional average percentage of elders is 18.2 percent in Northeast, 18.3 percent in Southeast, 20.2 percent in the Central United States, and 17.7 percent in the West.

[2] Below the poverty line in 1989 as defined by the U.S. Bureau of the Census (1990 Census Population Data).

A sample of sentinel agencies was drawn from the 20 counties. In two rural counties, Rusk and Presque Isle, there were fewer than 12 eligible agencies (other than banks). Otherwise, on average, 12 to 13 agencies per county were selected. Two banks per county were selected to ensure that possible incidents of financial exploitation of elders would be identified. The remaining agencies were distributed among the other three categories proportional to the number of agencies available in each county. Proportional allocation methodology was based on a simple logic that different categories of agencies should be appropriately represented in the pool of agencies sampled.

Whenever possible, agencies were selected using a stratified probability proportional to the size of the agency. When a reasonable measure of size could not be ascertained, an equal probability sample of agencies was selected. A measure of size was available for most of the law enforcement agencies, hospitals, and banks, but not for the aging service providers. With slight modification for some sentinel agencies recruited late in the data collection period, the allocation of agencies in each county followed the following pattern:

- Two banks;
- At least one law enforcement agency;
- No more than two municipal police departments;
- No more than three law enforcement agencies (i.e., municipal police and sheriff's departments);
- At least three hospitals;
- Public health departments with certainty in small counties, if available; and
- Sheriff's departments with certainty in small counties.

Small counties, with fewer than 10,000 elders, included Madison, Giles, Presque Isle, and Rusk. These counties had too few agencies of one or more types required for the study. Rusk County did not have a public health department. Although the study design called for at least three hospitals per county, Bay County had only two hospitals; there was one each in Madison, Giles, Presque Isle, and Platt. There were no hospitals in Rusk County, and no banks in Presque Isle.

Table 3-3 contains the available number of agencies by type, along with the number selected. Using PPS sampling by strata, an average of 12.4 sentinel agencies were selected in each county. Agencies chosen to replace agencies that had refused to participate were selected with the same probability as the sampled agencies. A description of sampling procedures for each type of agency and its potential replacements can be found in Appendix D.

Table 3-3. Sentinel agency allocation by agency type

County	Available Banks	Banks Partic-ipating	Available law enforcement agencies	Law enforcement agencies Partic-ipating	Available hospitals/public health (PH)	Hospitals/ (PH) Partic-ipating	Available elder care providers (ECPs)	ECPs Partic-ipating	Total Partic-ipating agencies
Maricopa	25	2	19	1	27	3	99	7	13
Rusk	7	2	4	3	0	0	3	3	8
Bay	30	2	6	3	2	2	5	5	12
Pinellas	23	2	23	2	25	3	105	6	13
Bristol	36	2	20	2	25	3	45	6	13
San Diego	34	2	20	2	20	3	90	7	13
Madison	6	2	2	2	1	1	18	8	13
St. Clair	24	2	20	2	24	4	59	6	13
Mercer	18	2	11	1	14	3	88	7	13
Giles	4	2	2	2	2	2	18	7	13
Fayette	12	2	13	3	3	3	25	5	13
Grayson	8	2	7	1	5	3	70	7	13
Multnomah	37	2	5	1	12	3	58	7	13
York	15	2	14	3	3	3	19	5	13
Presque Isle	0	0	3	3	1	1	4	4	8
Delaware	36	2	37	2	18	3	51	6	13
Dupage	29	2	31	2	9	3	116	6	13
Cleveland	2	2	4	1	4	3	18	6	12
Platte	6	2	6	3	1	1	19	7	13

Pulaski	28	2	5	1	15	3	63	7	13
Total	380	38	251	39	182	49	973	122	248

Sampling Sentinels within Agencies

In the absence of knowledge of the propensity to observe elder abuse by different types of sentinels within a county, a self-weighting sample of 50 sentinels per county was proposed. This yielded a targeted total of 1,000 sentinels. One disadvantage of this self-weighting design was the possibility of overburdening some agencies, that is, attempting to recruit sentinels at a very high rate in counties with a small number of eligible agencies. One elder care provider, for example, had 78 eligible sentinels and, under the self-weighting design, almost all of these sentinels should have been sampled. Only 11 were recruited at that atypical agency, however, in order to distribute the respondent burden evenly. The following guidelines were used:

- Recruit at least one sentinel per agency;
- Recruit no more than eight sentinels per agency (except in unusually large agencies);
- On average, recruit four sentinels per agency; and
- Recruit about 250 sentinels per agency type (across all 20 counties).

If, during sentinel recruitment, it was learned that some potential types of sentinels were more likely to encounter abuse than others (e.g., the Elder Abuse task force in a police department), the self-weighting design was not used. Such special groups of sentinels were selected either with certainty or at a higher rate. During data collection it was learned that banks had fewer contacts with elders than ECPs; rates of sentinel recruitment were adjusted accordingly.

Evaluation of the Sample of Counties and the Estimates

Twenty counties (in 15 states) were selected to represent similar places across the continental United States, according to criteria discussed above and based on data from the 1990 Census. Altogether, there are more than 3,000 counties in the United States and, on average, more than 60 per state. The study's national annualized estimates are based on data obtained from a small fraction of these counties

and, in addition, are derived from only 2 months of data. It is, therefore, important to examine the accuracy of the estimates using outside sources, to the extent possible.

The National Center on Elder Abuse, in the spring of 1997, conducted *A Survey of State APS and Aging Agencies on Domestic Elder Abuse [Data] for FY 95 and FY 96.* A survey instrument, designed to collect aggregate statistics for domestic elder abuse, was sent to state APS agencies and State Units on Aging. Figures received from states in this survey represent counts of domestic elder abuse reports to state report-receiving agencies. A report may involve more than one elderly person and, similarly, one person may be reported more than once as an alleged victim of abuse.

Data of similar character were collected from each of the county APS agencies in NEAIS for a 2-month period. These data were compiled to be comparable to the NCEA survey of domestic elder abuse reports, leaving duplicate and unsubstantiated cases in the totals. Then, using estimation methods described later, data were weighted to represent national totals and annualized. Table 3-4 below compares these annualized national estimates of APS data from NEAIS with totals obtained from the 48 contiguous states, by region. In each of the four regions, the proportion of cases in the data obtained from states by NCEA is very close to the national estimates. It was estimated, for example, that 16 percent of the weighted incidents reported by APS to the study came from Region 1, the Northeast; 17.5 percent of the reports from the states to NCEA were contributed by states in Region 1. Across the other three regions, there are differences of only a few percentage points between the NEAIS estimates and the NCEA actual totals. Furthermore, the total number of reports obtained directly from the states is fewer than 4,000 cases, (less than 1.5 percent) greater than the estimated total. The statistical procedures used to produce the national estimate appear to be extremely accurate.

Table 3-4. NEAIS annualized national estimates from APS data in 20 counties by region compared to NCEA's Survey of Domestic Elder Abuse Reports (duplicated totals)

	NCEA survey	NEAIS
Region	State-by-state totals 1996	National estimates 1996
1	50,746 (17.5%)	46,403 (16%)
2	74,881 (25.6%)	64,156 (22%)

3	47,368 (16.3%)	56,868 (20%)
4	117,318 (40.4%)	119,016 (42%)
Total	290,314 (100%)	286,443 (100%)

3.3 Instrument Development

Since APS case workers and sentinel agency staff, rather than professional interviewers, would be completing data forms, their design had to be simple, requiring as few references as possible to other documents. Several versions of instruments were pretested with local APS and service agency staff to fine tune them and simplify procedures as much as possible.

The APS and sentinel instruments were identical with two exceptions: the APS instrument included sections for reporting the sources of the report to the agency and for the disposition of the case. These items were not applicable to the sentinel instrument. Appendix E contains the data forms for APS and sentinel agencies. Insert pages ("Additional Parts A") were created for circumstances in which more than one elder in the household was abused. An additional Part A is also included in Appendix E. The final version of each instrument was a single 11" x 17" page printed back to back and folded in the middle.

Pretesting Data Collection Instruments

Pretests were conducted at six sentinel agencies and in two APS sites during the months of May, June, July, and August 1995. Participants were briefed in person on the purpose of the study and then asked to review each item on the form to see if the wording was clear and if the requested information was available in the records at the pretest location. Pretest participants were encouraged to critique the format and question order as well. Participants were given one or more forms and asked to complete them and return them to Westat by mail or fax. Eight APS forms and ten sentinel forms were received. Table 3-5 below summarizes the pretest dates and number of forms received from each agency.

Both APS and sentinel pretest offered many constructive comments agencies. During the 2½ months of pre-testing, the instruments were revised four times. Where appropriate, pre-testers' suggestions were incorporated into the final instruments.

Table 3-5. APS and sentinel agency pretest dates and number of forms received

Agency	Date completed	Number of forms received
Adult Protective Services		
Montgomery County	6/8/95	3
Fairfax County	6/27/95	5
Sentinel agencies		
The Support Group	5/23/95	4
Potomac Home Care	7/13/95	1
Fastran Transportation	5/31/95	1
Crestar Bank	7/31/95	1
Meals on Wheels	7/21/95	1
In-home Hospice Care	8/25/95	2
Total		18

Institutional Review Board (IRB)

The NEAIS study design and data collection forms and procedures were reviewed by the IRB at Westat on June 13, 1995, and twice annually after that. The project qualified for an exemption from the requirement to obtain informed consent because no identifiable information about victims of abuse, alleged maltreaters, or reporters of the abuse were recorded on any of the data collection forms. Because of the confidential nature of the information, however, the IRB cautioned that the data be safeguarded from any possibility of identifying the subjects of the reports or the reporters, and recommended several modifications to the forms and data collection procedures. (See Appendix F for IRB approval letter.) The final data set must be prepared in a format that eliminates the possibility of identifying counties, agencies, sentinels, or alleged victims.

3.4 APS Agency and Sentinel Agency Recruitment

Agency recruitment followed two different tracks: recruitment of APS agencies was the responsibility of APHSA; recruitment of sentinel agencies was the responsibility of Westat. Recruitment procedures for each type of agency are described below.

APS Recruitment

Adult Protective Services are provided by various agencies across the United States. The designation of the agency responsible for handling protective services is made at the state level, and the designated agency varies by state. In 29 states, the APS agency is located in the social services agency in the state. In 19 states, the APS program is located in the state unit on aging, but within the social service agency. In 6 states, the APS program is located in the state unit on aging and outside the social service agency. While the staff of most APS agencies receive and conduct investigations directly, in some states the APS agencies contract with local non-profit agencies to conduct elder abuse investigations and related activities (e.g., California and Illinois). These organizational variations mean that the NEAIS recruitment procedures involved different agencies in each state. (See Appendix G for the location of APS agencies by state.) Regardless of their locations in the state structure, many APS agencies limit their protective services to vulnerable elders (e.g., dependent, impaired, or incapacitated persons).

The recruitment of APS agencies involved several steps. In mid-April of 1995, a letter of introduction and an agreement form was sent to APS/aging agency directors in each sampled county. The agreement form, once signed by the agency director, committed an agency to participate in the study and designated a "local contact person." Between April and August of 1995, agreements to participate were received from 19 of the 20 sampled counties. During August of 1995, a letter and questionnaire were sent to designated local contact persons. The questionnaires were used to collect baseline data for each county, as well as information helpful in the design of the data collection forms and training materials. By December 1995, after determining that the remaining agency, Westchester County, NY, would not participate in the study, Delaware County, PA, was selected as a replacement. Delaware County was selected randomly from counties with characteristics as similar as possible to Westchester County. Delaware County agreed to participate in January 1996.

Sentinel Agency Recruitment

Local service agency directories typically did not include names of directors or agency employees. When such names were provided, they were not necessarily current or might not be the appropriate contact person. Accordingly, Westat staff contacted each sentinel agency and asked for the name and title of the person who would be able to decide about the agency's participation in a national

study on elder abuse. Westat then confirmed the decision-maker's telephone number, fax number, and street address.

The initial contact letters were sent sufficiently early to allow recruitment to be completed before the start of data collection. Two different contact procedures were utilized, depending on the type of agency. For smaller agencies, contact letters were sent 4 to 6 weeks before the beginning of data collection. For larger agencies or agencies likely to have several levels of bureaucracy, 6 to 8 weeks of lead time was allowed; for example, hospitals often referred our recruiters to three or four people before the decision maker could be identified. Even then, many required the approval of legal departments, research committees, or approval through their own IRB.

Selection of Sentinels within Agencies

If possible, sentinels were sampled during the recruitment telephone conversation with the person designated by the sentinel agency to be the point of contact with NEAIS. To be eligible for the sample frame of sentinels from the agency, persons had to have frequent contact with the elderly and had to be able to identify abuse if they encountered it. Each attempted call to an agency and the outcome of the call were recorded on a telephone log. When the person listed as the addressee or another person who could make a decision concerning the agency's participation was successfully contacted, a recruitment script was used to ask a series of questions on the structure and size of the agency. Because the kinds of agencies participating in the study had very different organizational features, different scripts were developed for different kinds of organizations such as law enforcement agencies, in-home service providers, out-of-home providers, senior centers, and banks.

A Microsoft Excel program was used to randomly pick every *nth* sentinel from a roster of sentinel candidates provided by the agency. Part-time as well as full-time agency staff were eligible for consideration. Professional staff were preferred, although volunteers were selected occasionally when professional staff were not available. The number of sentinels selected per agency was typically four to six, according to sampling guidance received from project statisticians. In some instances, an agency's participation was contingent on taking all eligible staff (e.g., an entire emergency room staff at a hospital). In such cases, the project accepted the agency's designated participants and noted the special circumstances so that proper weighting could be attached to these unusual agencies. Table 3-6 shows the numbers and percentages of sentinels who were sampled and who participated, after accounting for refusals and sentinels

who left the agency. Among the 1,158 sentinels who were asked to participate in the study, only 4 refused to do so.

APS and Sentinel Agency Followup Procedures

Data collection took place over a 12-month period, according to the schedule presented in Figure 3-2, with either one or two counties starting data collection each month for 12 months. Sentinel data collection took place over an 8-week period, while for APS agencies in the same counties, data collection extended 2 weeks beyond the second month so that any instances of abuse or neglect identified by sentinels at the end of the data collection period could be included in the APS database, if reported to the local APS agency.

Table 3-6. Sentinel participation status, by agency type

	Agency type						
Sentinel Status	Sheriffs	Municipal police	Public health departments	Hospitals	Banks	Service providers	Total
Total selected	51	230	18	192	72	602	1165
	4.38%	19.74%	1.55%	16.48%	6.18%	51.67%	100.00%
Left agency[1]	0	2	0	1	0	0	3
	0.00	0.17%	0.00	0.09%	0.00	0.00	0.26%
Refused	0	2	0	1	0	1	4
	0.00	0.17%	0.00	0.09%	0.00	0.09%	0.34%
Active participant	51	226	18	190	72	601	1158
	4.38%	19.40%	1.55%	16.31%	6.18%	51.59%	99.40%
Participation rate	100%	99%	100%	99%	100%	99.8%	

[1] Excluded from participation rate

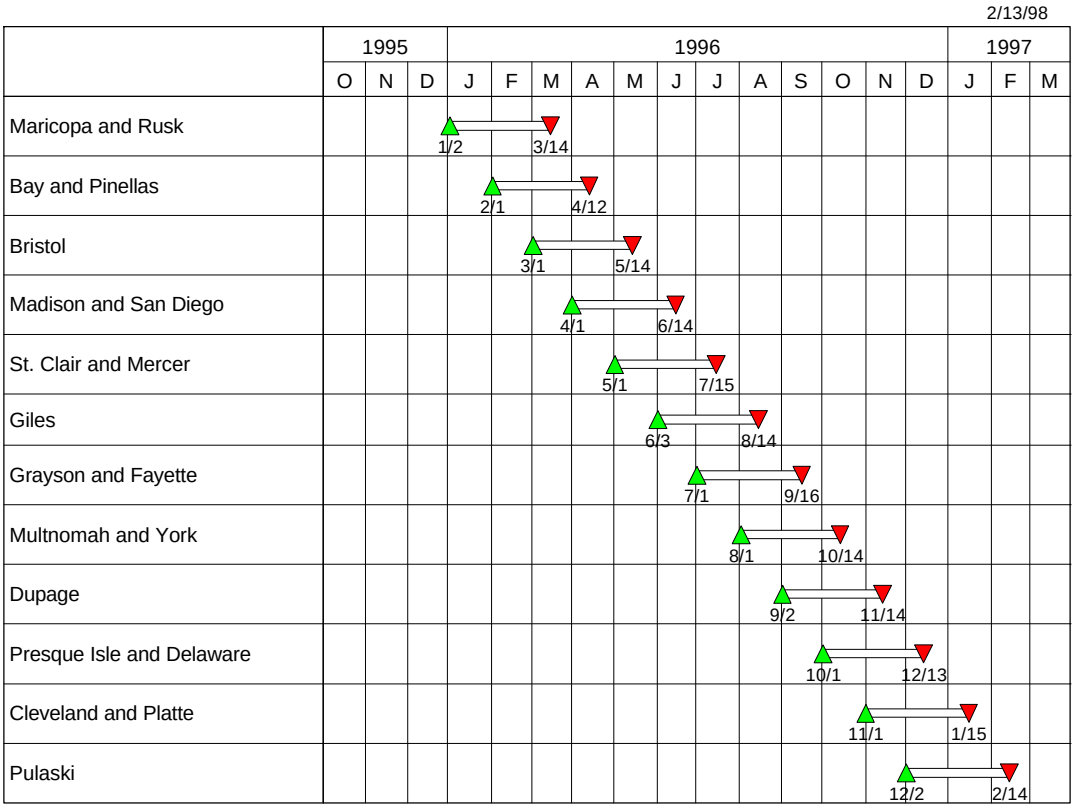

Figure 3-2. Start and stop dates for each participating county

Because of the substantial time lag between recruitment and data collection in many counties, it was important to remind agencies not currently involved in the study of their commitment to participate. For APS agencies, this was done by periodically sending a reminder letter and an incentive, for example, complimentary copies of *Elder Abuse: Questions and Answers An Information Guide for Professionals and Concerned Citizens*, the *NCEA Exchange*, and *Fact Sheets.* Sentinel agency contacts were called periodically to remind them of the upcoming data collection schedule and to alert them to expect an express package containing training materials and data collection forms.

Adult Protective Services and Sentinel Training

An innovative approach was developed for training sentinels and APS agency personnel using specially designed materials and a video. Training included the following items:

- An attractive 17-page participant guide book (see Appendix E) provided information on the study design, confidentiality, responsibilities of study participants, definitions of elder abuse, and procedures for returning completed data forms;
- Two 35-minute videos were developed—one for APS staff and the other for sentinel agencies; and
- An "800" telephone number was available for participants to call with any questions about data collection procedures or client eligibility.

Except for small differences in items on reporting sources and disposition of reported cases, the APS and sentinel videos shared the same core material. Westat prepared the scripts, with revisions suggested by the American Public Welfare Association (APWA) and the Administration on Aging (AoA) Project Officer. Two professional readers recorded the revised script in a professional sound studio. Next, Westat's graphics department merged the sound track with artwork produced in-house, making master tapes that were then copied onto VHS videotapes for distribution to APS and sentinel agencies during recruitment.

In addition to being more cost effective than in-person training, a video approach has several other advantages. A training video is a reference tool that can be used to refresh the memories of sentinels and agency contact persons. In addition, it is easier to maintain the anonymity of participating sentinels and sentinel agencies through video training.

Several weeks before data collection in a particular county, a call or letter reminded the local contact person that data collection would begin the following month. Approximately 1 week later, the following training package and data collection materials were sent:

- A letter reconfirming the agreement to participate in the study;
- A letter from the Assistant Secretary for Aging, AoA, Fernando Torres-Gil
- A packing slip;
- Training videotapes (typically, one for each of four participants);
- Sentinel and APS/aging agency guidebooks (one copy for each participant, employee, or sentinel participating in the study);
- Video viewing instructions;
- Data collection forms;

- Additional Parts A;
- Transmittal sheets;
- Pre-addressed/pre-stamped mailers;
- Additional instructions for APS employees; and
- Label sheets.

The day after the training materials were scheduled to be received, the local contact person was called to ensure that the package had arrived and to schedule a conference call after APS workers and sentinels had an opportunity to view the training video and read the guide. See Appendices H and I for the Adult Protective Services/aging agencies training materials.

The discussion of the contents of the video typically took place 1 week before the beginning of data collection. Site visits were scheduled midway through the data collection period at the first data collection site and at several others where assistance was needed.

Recruitment of Alternate Sentinel Agencies

Recruiters, project staff trained to persuade agencies to participate in the study, sometimes discovered during attempts to contact administrators that agencies had gone out of business, merged with another agency, or did not serve elderly clients. In such instances, an alternate agency was selected from a list of randomly assigned substitutes. The substitute agency was contacted after a recruitment package had been forwarded, as described above.

Sentinel Agency Refusals and Refusal Conversions

Several strategies were employed for "refusal agencies." These included, depending on the reason for the refusal, (1) express mailing a package with a persuasive letter and with the training video; (2) faxing a copy of the data collection instrument; (3) reassigning the agency to another recruiter; and (4) assigning the agency to senior project staff. Attempts to recruit a single refusal agency might employ all four strategies. Unless the refusal came from the most senior person at an agency, recruiters tried to persuade the contact person to identify someone else more senior to whom the recruiter or senior staff could

speak. During weekly staff meetings, project staff discussed alternative recruitment strategies, and a plan of action was developed for each refusal. A replacement agency was selected only after all recruitment efforts had been exhausted. Bank participation rates were particularly low. Most banks declined to participate on the advice of corporate counsel or senior bank staff. Efforts to secure a letter of endorsement from the American Bankers Association were unsuccessful. It is noteworthy that only one completed form was returned from a bank sentinel among the 16 participating banks. Agency participation status by type of agency is shown in Table 3-7.

Table 3-7. Participation status, by agency type

	Agency type						
Status	Sheriffs	Municipal police	Public health departments	Hospitals	Banks	Service providers	Total
Total selection	13	41	13	58	59	280	464 (405)
Ineligible/ Merged	1 (7.6%)	1 (2.4%)	8 (61.5%)	7 (12.1%)	6 (10.2%)	109 (39%)	132 (126)
Refused	1	3	0	10	37	35	86 (49)
Participating agencies	11 (91.6%)	37 (92.5%)	5 (100%)	41 (80.4%)	16 (30%)	136 (80%)	246 (230)

Participation Rate: Seventy-four percent including banks; 82.4 percent without banks. Total numbers in parentheses exclude banks. Total percentages in parentheses exclude ineligible or merged agencies.

3.5 Data Collection

As described earlier, data collection was spread over 12 months, beginning in January 1996, following the pattern presented in Figure 3-2. APS and sentinel procedures are described below.

APS Data Collection

On the first scheduled day for data collection in each county, a telephone call was made to remind the local contact person in the APS agency and to answer last-minute questions. Approximately every 10 days, the contact person was called to determine how many reports had been received by the agency and how many forms had been completed. These telephone calls provided continuous monitoring of the progress of the agency and allowed study staff to estimate the number of expected data forms. Finally, they provided the study participants with another opportunity to ask questions.

The local contact person was reminded when 1 week remained in the data collection period. On the last day, the local contact person was asked to send in all completed forms. Within a month after the end of data collection in each county, forms received from the APS/aging agency were reviewed, coded, and entered into the database. Similar procedures were followed with sentinel agencies, in addition to the procedures noted below.

Sentinel Data Collection

Sentinel data collection procedures were similar to APS agencies; however, sentinels were asked to send reports without the approval or review by the agency contact. This procedure ensured that the agency contact—the person with responsibility for disseminating the data collection materials and talking weekly to Westat's home office about sentinel absences or replacements—did not inhibit the sentinel from forwarding cases. Information about sentinel absences or replacements obtained during these periodic telephone calls was used in weighting the data. Sentinels were also asked to forward reports of suspected cases of elder abuse as soon as possible after observing the suspected abuse. Sentinels did not attempt to substantiate incidents of abuse.

Site Visits to APS/Aging Agencies and Sentinel Agencies

Site visits to APS agencies were conducted for several reasons. Maricopa and Rusk were the first sites to begin data collection, and APHSA wanted to monitor how the study was being implemented. Bristol and San Diego Counties were visited at the request of the APS agencies. Multnomah was visited because a large number of cases were expected there. Madison County, on the other hand, was a very

small county and APHSA wanted to observe any differences from larger sites in the implementation of the study.

Table 3-8 shows the location and dates of site visits to six counties that were made to APS/aging agencies.

Table 3-8. APHSA site visits to APS agencies

County/state	Site visit dates
Maricopa County, Arizona	02/05/96 thru 02/09/96
Rusk County, Texas	02/05/96 thru 02/09/96
Bristol County, Massachusetts	03/13/96 thru 3/15/96
San Diego County, California	04/10/96
Madison County, North Carolina	04/30/96
Multnomah County, Oregon	08/16/96

Table 3-9 shows the location and dates of site visits conducted by Westat to five counties. These visits included the first (Maricopa and Rusk) and last (Pulaski) participating counties. Multnomah was visited because a large number of forms were expected from Multonomah sentinels. Cleveland County was visited because it was a nonmetropolitan county with a large percentage of elderly residents. Project staff met with sentinels and agency contacts at nearly all participating agencies in the five counties. Site visits were conducted to determine if sentinel agencies were following the procedures presented in the training video and APS/sentinel guide, to answer any questions from sentinels and agency contacts, and to gauge the degree of interest in the study by the participating agencies. Project staff found great interest in the study and diligence in following study procedures. (See Appendix J for site visit information.)

Table 3-9. Westat site visits to sentinel agencies

County/state	Site visit dates	Number of agencies visited
Maricopa County, Arizona	02/05/96 thru 02/09/96	12
Rusk County, Texas	02/05/96 thru 02/09/96	8

Multnomah County, Oregon	08/26/96 thru 08/28/96	11
Cleveland County, North Carolina	11/18/96 thru 11/19/96	12
Pulaski, Arkansas	01/06/97 thru 01/08/97	13

Certificates of Appreciation

After data collection was completed in each county, a certificate of appreciation was mailed to each sentinel and sentinel agency contact, and to APS/aging agency staff. The certificates were produced on high-quality bond paper, with a gold, embossed seal certifying that the recipient had participated in the NEAIS. An example of the certificate is included in Appendix K.

Special Procedures in San Diego, California

San Diego County sentinel agencies required special data collection procedures because of difficulty in getting sentinel agencies there to return completed forms. Westat employed an experienced interviewer, who visited each agency to assist sentinels in completing and collecting forms. Prior to the interviewer's visit, a letter was sent to each agency contact informing that person of the data collector's visit. Despite the diligence of the interviewers, this procedure resulted in only three completed forms. It was not necessary to use in-person data collection visits in the other 19 participating counties.

3.6 Data Receipt

Data collection forms from both APS and sentinel agencies were sent to Westat. Westat staff reviewed sentinel forms for completeness and called the sending sentinel directly if there were any questions. Similarly, APHSA staff reviewed APS data forms and called the APS agency contacts to discuss missing or unclear data.

APS agencies followed specific procedures for transmitting completed data forms to the home office, as detailed in the training video. The local contact person at the APS/aging agency was responsible for the collection and transmission of completed APS data forms. Following a review of the forms, the contact person then completed a two-ply transmittal form, kept a copy for his/her records, and forwarded

the completed forms and transmittal sheet in a prestamped, pre-addressed envelope. Procedures varied slightly between the larger and smaller agencies. In larger APS agencies, several staff members checked the completed forms before the contact person sent them to the home office. In the smaller agencies, the data forms were often photocopied before the originals were sent to the home office.

Sentinels followed procedures similar to those for APS agencies. The principal difference was that the role of the sentinel agency contact was limited to providing information to sentinels, training them, and distributing study materials. To encourage candid, confidential reporting, we asked agency contacts not to review or edit the forms completed by the sentinels. Moreover, sentinels were instructed to send forms directly to the home office, further insulating them from the possibility of influence by the agency contact. Sentinels were asked to complete and mail the data form on the same day a case was identified to minimize the possibility that events surrounding the abuse might be forgotten or incorrectly recollected. Sentinels kept a copy of the transmittal sheet and sent the forms in a pre-addressed prepaid mailer.

Keying

Both APS and sentinel data forms were entered into a data receipt system according to ID number, form type (APS or sentinel), and date of receipt; they were then batched in groups of 20. After batching, forms were keyed directly into a data entry program created in Microsoft Access. The data were entered using PCs with screens that mirrored the data collection instrument.

Coding Data Forms

Both APS and sentinel data forms required respondents to provide a brief narrative describing the maltreatment events. After keying, this maltreatment information was evaluated according to the study definitions and eligibility criteria.

Cases that did not meet the study definitions were excluded from the database. A case was excluded for the following reasons:

- Victim resides in an institutional setting (e.g., nursing home, foster care);
- Victim is under 60 years of age;

- Victim resides outside county; or
- The incident was not abuse by definitions used in NEAIS.

In some instances, additional categories of maltreatment, other than the one coded by the respondent, were indicated based on the description of the alleged incident. A second trained staff person reviewed any proposed change in code before a final change was made. If necessary, miscoded items were reclassified into the proper category.

A review of the APS data forms resulted in recording the maltreatment codes in 180 cases. During coding, 41 APS data forms were removed from the database for not meeting any of the seven definitions of elder abuse described earlier in this report. Only five sentinel forms were removed because they did not meet criteria.

3.7 Unduplication

Sometimes more than one data form was received for the same alleged maltreated elder describing either the same or different abusive incidents. It was necessary to identify such duplicates and count each person only once for purposes of this study. This process is known as "unduplication."

Various types of duplicate reports were submitted to the study concerning the same alleged maltreated elder. The first type was **APS-APS duplication**, in which an APS agency submitted two or more data forms on the same person. The second was **sentinel-sentinel duplication**, in which two or more sentinel forms were received on the same alleged maltreated elder. The forms could have come from the same sentinel or from different sentinels and/or from different participating agencies (e.g., a police station and a hospital). The third type was **APS-sentinel duplication**, which occurred either because the sentinel forwarded the incident to APS and both agencies subsequently submitted a data form to the study, or because the same incident was reported independently to APS by another source.

To accommodate all possibilities for duplicate reporting, the data collected on the forms were sorted across three different groups using Microsoft Access, comparing elder's first name, last initial, date of birth, and age:

- Exclusively across all APS data forms;

- Exclusively across all sentinel forms; and
- Crossing APS and sentinel forms.

Possible duplicate cases across all possible combinations were identified after comments and other key data associated with the duplicate reports had been reviewed. Ninety-three sets of reports were determined to be genuine duplicates. Extra or duplicate cases reported both to APS and sentinel agencies were removed from the sentinel data file, so that such duplicated instances of abuse and neglect were counted as reports to APS. The largest number of duplicates (57 of the 93) were this type. Duplicate sentinel reports were assigned to the sentinel agency that first sent in the form. These numbers are presented graphically in Figure 3-3.

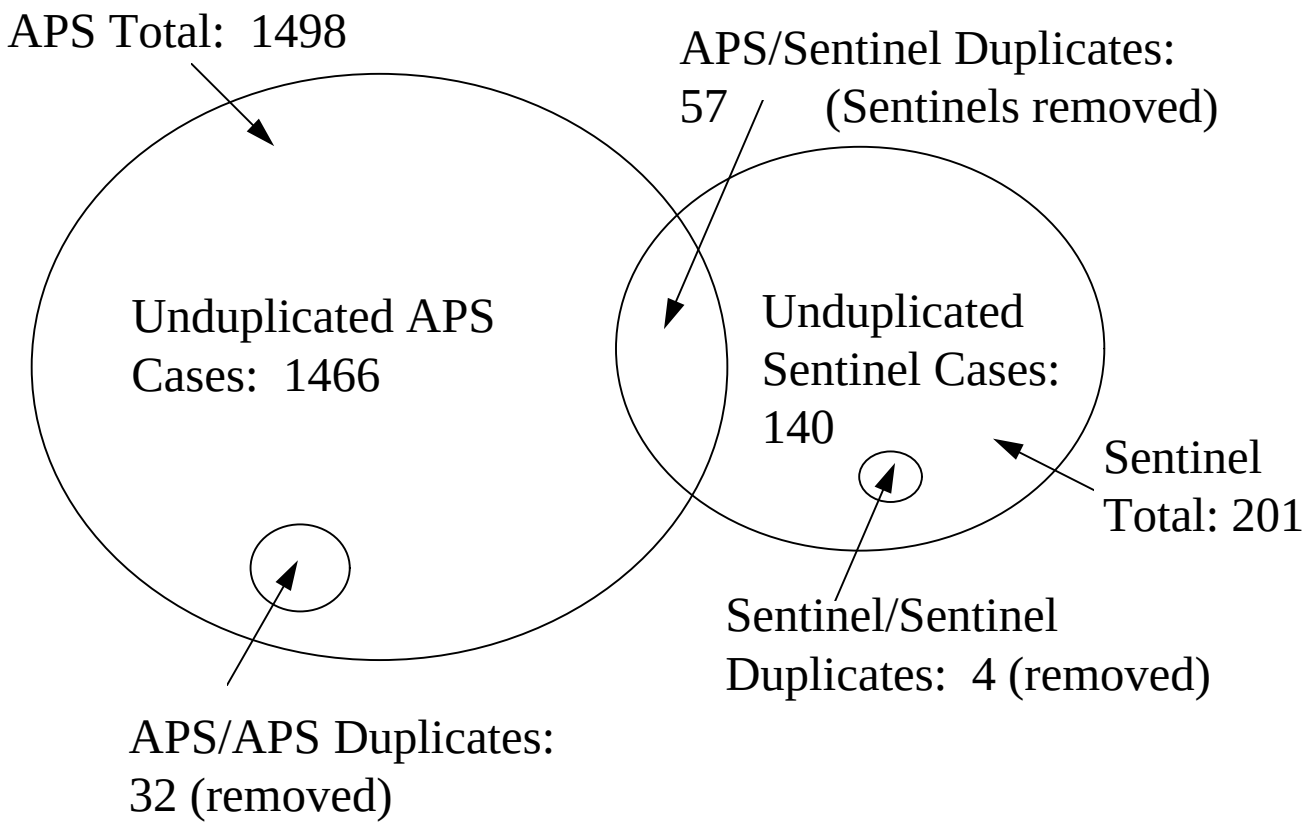

Figure 3-3. Duplicated and unduplicated APS and sentinel reports

3.8 Participant Tracking

During the 2-month data collection period, sentinel agencies were called each week to confirm that the sampled sentinels were present on the job and thus were able to observe elder abuse if they encountered it. The outcome of each call was recorded in a database using a specially designed program that summarized information for each week. The information included whether the sentinel was a part-time or full-time sentinel during the week, and whether the sentinel was present most of the time or part of the time during scheduled hours. Sentinel tracking data were used in weighting the data.

APS agencies were not tracked, since data were not collected from individuals within the agency, and the APS agency was presumed to be open during normal business hours. Nevertheless, APWA staff made frequent calls to APS agency contacts to monitor the progress of cases that were still under review to determine whether or not they had been substantiated.

3.9 Weighting the Responses

The process of weighting involves the computation of case-specific sampling weights used to produce unbiased estimates of the population parameters of interest. The weights are needed in the statistical analysis to compensate for the variable probabilities of inclusion in the sample. Even for samples in which units are selected with equal probabilities, weighting may still be necessary to compensate for differential rates of nonresponse and deficiencies in the sampling frame. Weighting complex survey data, such as the data from NEAIS, generally involves many steps. The most important steps are the determination of overall probabilities of selection, calculation of base weights, calculation of nonresponse adjustments, and development of replicate weights. A detailed explanation of the following components is provided in Appendix L.

PSU Base Weights

The base weight of a sampled county is defined as the reciprocal of the probability of selecting that county. The base weights are unbiased in that the expected value of a weighted estimate, based on the sample data, is equal to the corresponding population value that would have been obtained if

all the counties (rather than a sample) in the United States were surveyed. The base weights of the sampled counties ranged from 5.79 (San Diego County, California) to 569.66 (Madison County, North Carolina).

Weighting of APS Data

Unlike the sentinel records, there are no further sampling stages for the APS data. In addition, there is no nonresponse adjustment, since all APS agencies in the sampled counties participated in the study. Therefore, all the records received from the APS agencies were assigned their respective PSU base weight and multiplied by an annualization factor of six (described below), to give the full sample final weight.

Annualization

The NEAIS data collection period extended from January 2, 1996, to February 2, 1997. Data were collected over a period of 2 months in each of the sampled counties. The counties were distributed in such a way that there were four or five counties reporting in any particular month, except at the beginning and the end of this period. In addition, a start date was assigned such that in most months, two large counties and two small counties were reporting, except at the beginning and the end of the study. This approach minimized the potential for a seasonal affect to bias the estimate of the incidence of elder abuse. The estimate of elder abuse over these 2-month periods was transformed to an estimate for the study year by multiplying by a factor of six.

Agency Weight (non-APS Agencies)

The agency base weight (ABW) of each non-APS agency is, in most cases, the inverse of the probability of selection. As described in the agency sampling description in Section 3.2, the probability of selection, in most cases, was obtained from the WESSAMP output. Within each county the selection probability was proportional to a measure of size of the agency so that the ABW was inversely proportional to the agency size.

However, the selection probabilities of the elder care provider agencies were adjusted to account for the fact that there was deliberate oversampling in anticipation of many non-existent or ineligible agencies, since it was not possible to construct a completely reliable frame.

Agency Nonresponse Adjustments (Sentinel Agencies)

The base weights are unbiased weights that inflate the sample data to population levels. Nonresponse in the study results in losses in the sample data that must be compensated for in the weights. In this case, the sentinel agency weights must be adjusted to compensate for the reduction in sample size. If nonresponse occurs at random, such adjustments are unbiased; however, nonresponse almost never occurs randomly. Consequently, such adjustments are typically made within classes that are internally as homogeneous as possible with respect to the agency characteristics. Thus, nonresponse adjustments are used to attenuate the biases that result from the likelihood that reports supplied by the nonrespondents (if they had been obtained) would have been different from those of the respondents.

Sentinel Weights

Because an equal probability scheme was used to select the sentinels, within each agency the sentinel base weight for each participating sentinel is the simple ratio of number of eligible sentinels divided by the number of participating sentinels. The sentinel base weight was inflated by the rate of participation (or percentage of coverage). The rationale behind this is the assumption that a sentinel participating 50 percent of the time would have witnessed twice as many elder abuse incidents if he/she had participated 100 percent of the time.

Sentinel Case-Level Weight

There were 140 forms returned (after unduplication) by 74 reporting sentinels from 53 agencies. Each form was assigned a sentinel case-level weight. The aggregate weight distribution by agency type, during the reporting period of 2 months, is presented in Table 3-10 for the sentinel case-level weights.

Table 3-10. Aggregate sentinel case-level weights by PSU and agency type

OBE region	Site ID (fielding order)	County	Agency type*	Reporting agencies	Reporting sentinels	Forms returned (RR)	Aggregate weight (W)	W percentage	W percentage within OBE
1	05	Bristol	03	1	1	9	6,628	7.6%	37.0%
1	05	Bristol	05	1	1	2	165	0.2%	0.9%
1	05	Bristol	07	2	3	3	1,856	2.1%	10.4%
1	09	Mercer	05	1	1	1	232	0.3%	1.3%
1	09	Mercer	07	2	3	3	1,418	1.6%	7.9%
1	12	Fayette	07	2	3	3	867	1.0%	4.8%
1	14	York	03	1	1	1	1,275	1.5%	7.1%
1	14	York	07	2	5	9	5,168	5.9%	28.9%
1	17	Delaware	05	3	5	9	299	0.3%	1.7%
2	04	Pinellas	05	1	1	1	88	0.1%	0.5%
2	04	Pinellas	07	1	1	3	565	0.6%	2.9%
2	06	Madison	07	1	1	1	14,608	16.7%	76.3%
2	10	Giles	07	1	1	2	2,093	2.4%	10.9%
2	18	Cleveland	07	2	4	5	896	1.0%	4.7%
2	20	Pulaski	02	1	1	1	48	0.1%	0.2%
2	20	Pulaski	05	2	2	3	168	0.2%	0.9%
2	20	Pulaski	06	1	2	3	570	0.7%	3.0%
2	20	Pulaski	07	2	2	2	113	0.1%	0.6%
3	03	Bay	04	1	3	5	1,571	1.8%	4.0%
3	03	Bay	05	1	1	1	785	0.9%	2.0%
3	03	Bay	07	1	1	1	1,087	1.2%	2.7%

Table 3-10. Aggregate sentinel case-level weights by PSU and agency type (continued)

OBE region	Site ID (fielding order)	County	Agency type*	Reporting agencies	Reporting sentinels	Forms returned (RR)	Aggregate weight (W)	W percentage	W percentage within OBE
3	08	St. Clair	07	1	1	1	327	0.4%	0.8%
3	15	DuPage	07	2	2	5	25,388	29.1%	64.2%
3	16	Presque Isle	07	1	1	2	8,222	9.4%	20.8%
3	19	Platte	03	1	1	1	1,204	1.4%	3.0%
3	19	Platte	07	1	1	3	972	1.1%	2.5%
4	01	Maricopa	03	1	1	2	1,019	1.2%	9.5%
4	01	Maricopa	05	3	4	5	765	0.9%	7.1%
4	01	Maricopa	07	2	2	6	1,518	1.7%	14.1%
4	02	Rusk	03	1	1	1	218	0.2%	2.0%
4	02	Rusk	07	1	2	2	489	0.6%	4.6%
4	07	San Diego	05	1	2	2	53	0.1%	0.5%
4	07	San Diego	07	1	1	1	59	0.1%	0.5%
4	11	Grayson	03	1	1	1	1,241	1.4%	11.5%
4	11	Grayson	07	3	4	9	2,719	3.1%	25.3%
4	13	Multnomah	03	1	5	27	2,329	2.7%	21.7%
4	13	Multnomah	04	1	1	3	179	0.2%	1.7%
4	13	Multnomah	07	1	1	1	153	0.2%	1.4%
Total				53	74	140	87,356	100.0%	

* Agency Type Codes: 02=County Sheriffs 05=Hospitals
03=Municipal Police 06=Banks
04=Public Health Depts. 07=Elder Care Providers

Weight Trimming

It was observed that six forms (one from Madison County and five from Dupage County) contributed to nearly 46 percent of the aggregate weights; that is, the national estimate of unreported (not reported to APS) elder abuse incidents was heavily influenced by these six forms.

When just a few cases contribute such a large proportion of the total weight, national estimates became very unstable; that is, they have high sampling error. Thus, it is desirable to consider reducing the size of these extreme weights before carrying out analyses. The very slight bias that this procedure introduces into the estimates is of little consequence compared to the gains in sampling precision that result from weight trimming.

The next step was to determine suitable trimming factors to apply. The typical number of forms returned by sentinels from elder care providers (ECP) in metropolitan counties was determined, since sentinels from such agencies reported all six cases with extreme weights. The median number of reports per sentinel was found to be 0.41667. It was decided to adjust the weights of these six cases so that, after weighting, the average number of cases per sentinel did not exceed 0.41667. Under this criterion, four of the five cases from DuPage County received a trimming factor of 0.41667. The fifth case from DuPage and the one case from Madison County received trimming factors of 1.0 (i.e., no trimming was applied).

Even after this trimming process, a few cases contributed a large proportion of the total weight. One case from Madison County contributes 20 percent of the total, 28 times as large as the mean weight. Some records dominate the estimates in the study because suitable size measures for the ECP agencies included on the sampling frames were not available. Any further attempt to trim the weights would likely have led to a significant underrepresentation of reports from sentinels in relatively large ECP agencies. We judged that further trimming might introduce significant biases into the results.

Table 3-11 presents the aggregate weights of the reporting forms after weight trimming.

Table 3-11. Aggregate weights attached to sentinel forms after weight trimming

OBE region	Site ID (fielding order)	County	Agency type	Reporting agencies	Reporting sentinels	Forms returned (RR)	Aggregate weight (W)	W percentage	W percentage within OBE
1	05	Bristol	03	1	1	9	6,628	9.1%	37.0%
1	05	Bristol	05	1	1	2	165	0.2%	0.9%
1	05	Bristol	07	2	3	3	1,856	2.5%	10.4%
1	09	Mercer	05	1	1	1	232	0.3%	1.3%
1	09	Mercer	07	2	3	3	1,418	1.9%	7.9%
1	12	Fayette	07	2	3	3	867	1.2%	4.8%
1	14	York	03	1	1	1	1,275	1.7%	7.1%
1	14	York	07	2	5	9	5,168	7.1%	28.9%
1	17	Delaware	05	3	5	9	299	0.4%	1.7%
2	04	Pinellas	05	1	1	1	88	0.1%	0.5%
2	04	Pinellas	07	1	1	3	565	0.8%	2.9%
2	06	Madison	07	1	1	1	14,608	20.0%	76.3%
2	10	Giles	07	1	1	2	2,093	2.9%	10.9%
2	18	Cleveland	07	2	4	5	896	1.2%	4.7%
2	20	Pulaski	02	1	1	1	48	0.1%	0.2%
2	20	Pulaski	05	2	2	3	168	0.2%	0.9%
2	20	Pulaski	06	1	2	3	570	0.8%	3.0%
2	20	Pulaski	07	2	2	2	113	0.2%	0.6%
3	03	Bay	04	1	3	5	1,571	2.2%	6.2%
3	03	Bay	05	1	1	1	785	1.1%	3.1%
3	03	Bay	07	1	1	1	1,087	1.5%	4.3%
3	08	St. Clair	07	1	1	1	327	0.4%	1.3%
3	15	Dupage	07	2	2	5	11,026	15.1%	43.8%
3	16	Presque Isle	07	1	1	2	8,222	11.3%	32.6%
3	19	Platte	03	1	1	1	1,204	1.6%	4.8%
3	19	Platte	07	1	1	3	972	1.3%	3.9%
4	01	Maricopa	03	1	1	2	1,019	1.4%	9.5%
4	01	Maricopa	05	3	4	5	765	1.0%	7.1%
4	01	Maricopa	07	2	2	6	1,518	2.1%	14.1%
4	02	Rusk	03	1	1	1	218	0.3%	2.0%
4	02	Rusk	07	1	2	2	489	0.7%	4.6%
4	07	San Diego	05	1	2	2	53	0.1%	0.5%
4	07	San Diego	07	1	1	1	59	0.1%	0.5%
4	11	Grayson	03	1	1	1	1,241	1.7%	11.5%
4	11	Grayson	07	3	4	9	2,719	3.7%	25.3%
4	13	Multnomah	03	1	5	27	2,329	3.2%	21.7%
4	13	Multnomah	04	1	1	3	179	0.2%	1.7%
4	13	Multnomah	07	1	1	1	153	0.2%	1.4%
Total				53	74	140	72,994	100.0%	

3.10 Measuring Sampling Variability

Because the statistics presented in this report are estimates of national and subgroup characteristics and population sizes, based on samples of reports and sentinels, there is a degree of uncertainty in them. Had by chance a different sample been drawn, somewhat different results would have been achieved. This uncertainty in the results is referred to as sampling variability, or sampling variance. The degree of sampling variability present as a result of using a sample can be assessed from the sample data itself. For a particular estimate from the study, the associated measure of sampling variability is known as the standard error.

Because the study used a complex sampling design, conventional formulae for estimating sampling variability (that assume a simple random sampling procedure) are inappropriate. The standard errors presented in this report have been calculated using a technique known as jackknife replicated variance estimation. For a full presentation of the methods and properties of the jackknife procedure, see Wolter (1985) or Lehtonen and Pahkinen (1996).

When data are collected as part of a complex sample survey, there is often no easy way to produce approximately unbiased and design-consistent estimates of variance. The variance of survey statistics, including means and proportions, using standard statistical packages such as SAS or SPSS, are inappropriate and usually too small. A class of techniques called **replication methods** provides a general method of estimating variances for the types of complex sample designs and weighting procedures usually encountered in practice. The replication approach selects subsamples repeatedly from the whole sample, calculates the statistic of interest for each of these subsamples, and then uses the variability among these subsample or replicate statistics to estimate the variance of the full sample statistics. There are different ways of creating subsamples from the full sample. The subsamples are called **replicates** and the statistics calculated from these replicates are called **replicate estimates**.

Replication is not the only way to compute the variance of statistics from complex samples; however, replication is able to handle complex sampling designs, complex estimates, and complex weighting schemes. Replication can be used when other methods are not easily applicable. This method also has advantages even when other methods, such as Taylor series approximation, can be applied.

One of the main advantages of the replication approach is its ease of use during analysis. The same estimation procedure is used for the full sample and for each replicate. The variance estimates are then readily computed by a simple procedure. Furthermore, the same procedure is applicable to statistics such as means, percentages, ratios, and correlations. These estimates can also be calculated for analytic groups or subpopulations. It is not necessary for the analyst to understand the sampling or estimation methods if the replicate weights are included with the data.

The replication procedure used to estimate sampling variance for NEAIS data was a stratified jackknife procedure. The four OBE regions used as primary stratifiers in the sample design were used to define four strata for variance estimation purposes. Thus, within each stratum there were five county PSUs. A detailed description of variance procedures is included with the description of weighting in Appendix L.

3.11 Interpreting Results in the Presence of Sampling Variability

A common technique used to present and interpret statistical data that are subject to sampling variability is through the use of confidence bands. A 95 percent confidence band for an estimate is obtained by adding twice the standard error to the estimate of interest, to give the upper bound, and subtracting twice the standard error from the estimate of interest, to obtain the lower bound. The statistical interpretation of a 95 percent confidence band is that, if such a band were constructed from all possible samples that might have been selected, 95 percent of such bands would contain the true answer.

If the confidence band for an estimate is wide, relative to the size of the estimate itself, then this indicates that there is considerable uncertainty as to what the true value actually is. If, however, the band is narrow, then there can be confidence that the estimate is close to the true answer. Thus, for example, consider an estimate that a certain population characteristic is at the 10 percent level. If the confidence band for this estimate ranges from 1 percent to 19 percent, we can have confidence that the true level is something below 20 percent, but cannot draw any other inference with confidence. If an estimate of 10 percent is accompanied by a confidence band that ranges from 9 percent to 11 percent, then we can be confident that the true figure is little different from 10 percent.

Because the NEAIS sampled a relatively small number of counties, agencies, and sentinels, for many of the rarer characteristics described in this report, the confidence bands are relatively wide, like in the first example given in the previous paragraph. When this has occurred, the estimates presented in the report are duly noted as having this characteristic.

The width of the confidence band does depend to some extent upon the size of the estimate itself, but for a complex sample design such as this, there are several other factors involved as well. Thus two estimates of different characteristics, that happen to be of similar size, can well have quite different confidence bandwidths, and this happens in many cases for the results included in this report. A key factor that determines the width of the confidence interval is the extent to which the characteristic of interest varies from county to county, and from agency to agency and sentinel to sentinel in the non-APS sector of the study. Estimates for those characteristics that tend to vary little across these domains will tend to have smaller standard errors, and thus narrower confidence bands, than those characteristics that are highly variable across counties, agencies, and sentinels.